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Ground state energy of massive scalar field inside a spherical region in the global monopole background

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Abstract

Using the zeta function regularization method we calculate the ground state energy of scalar massive field inside a spherical region in the space-time of a pointlike global monopole. Two cases are investigated: (i) First, we calculate the Casimir energy inside a sphere of radius R and analyze the obtained result. We observe that this energy may be positive or negative depending on metric coefficient a and nonconformal coupling ξ. In the limit R→∞, this energy vanishes: (ii) In the second model, we surround the monopole by an additional sphere of radius r0